(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 166 895 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.01.2002 Bulletin 2002/01

(51) Int Cl.[7]: **B05D 7/06**, B05D 1/40, B05C 3/05

(21) Application number: **00126614.7**

(22) Date of filing: **04.12.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **26.06.2000 IT BG000024**

(71) Applicant: **Bettinelli, Alberto**
24031 Almenno S. Salvatore (Bergamo) (IT)

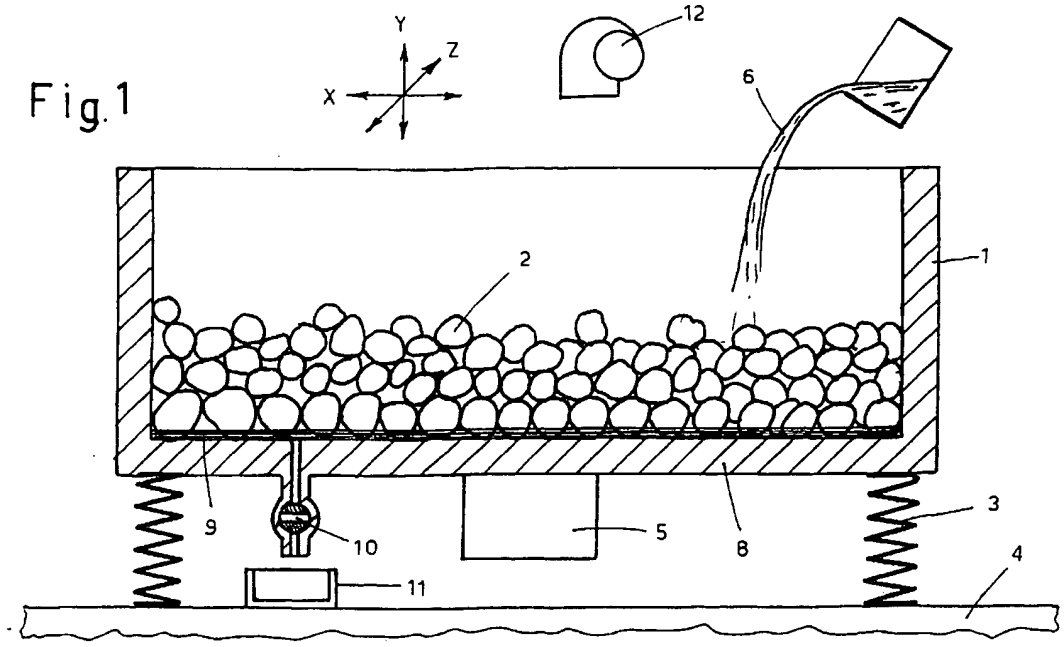
(72) Inventor: **Bettinelli, Alberto**
24031 Almenno S. Salvatore (Bergamo) (IT)

(74) Representative: **Luksch, Giorgio, Dr.-Ing. et al**
Ing. A. Giambrocono & C. S.r.l. Via Rosolino Pilo, 19/b
20129 Milano (IT)

(54) Vibration coating process, particularly for small wooden articles, and articles coated thereby

(57) A coating process, particularly for small-dimension wooden articles and water-based coating materials, characterised by placing the articles to be coated (2) in a vibrating tank (1) and pouring onto them a coating material (6) in the liquid state, in the quantity necessary for coating the articles, said coating taking place by application deriving from an infinity of small mutual coating transfer contacts between the articles (2) subjected to chaotic free movements and by the spreading and/or spraying (15) of drops 13) of coating material deriving from the considerable coating material separating acceleration to which said articles are subjected by the vibration of the tank (1).

Fig.1



EP 1 166 895 A1

Description

[0001] This invention relates to a vibration coating process, particularly for small wooden articles and water-based coating materials, and to the articles coated by said process. As is well known, small articles can be coated by various methods: by spraying, by immersion, by powder, etc. The choice of one of these methods depends on the shape of the articles, their constituent material and the surface appearance which is to be obtained.

[0002] The term "coating" means herein the application of transparent coating materials to confer lustre on those articles which would otherwise be opaque.

[0003] Such articles include those of wooden construction.

[0004] In this respect, given its porous nature and the intrinsic value of its graining, wood always requires treatment with transparent or semi-transparent coloured coating materials, to give the wooden articles a certain colour tone while leaving their typical wooden appearance unaltered.

[0005] As wood has a high capacity for absorbing liquids, its coating process must involve short liquid contact times, to prevent these liquids penetrating deeply and creating shape distortion or surface irregularities. This therefore makes it problematic to use water-based coating materials, making the use of coating materials based on synthetic solvents (toluene, xylene, etc.) inevitable. As these synthetic solvents are extremely toxic, the use of said coating materials involves very high costs connected with the adoption of environmental safeguard procedures and operator health protection. These costs are obviously loaded onto the product, and create loss of competitiveness.

[0006] An object of the present invention is to define a coating process which reduces the surface "wetting time" by the coating material, in order to reduce its absorption if the surface is of a wooden nature. Another object is to define a coating process which allows uniform distribution of the coating material over the entire surface of the article. Another object is to define a coating process in which operator intervention is reduced to minimum or irrelevant length, especially if the coating relates to small-dimension articles. These and further objects will be seen to have been attained on reading the following detailed description of a coating process, particularly for small-dimension wooden articles and water-based coating materials, characterised by placing the articles in a vibrating tank and pouring onto them the coating material in the liquid state, in the quantity necessary for coating the articles, said coating taking place by application deriving from an infinity of small mutual coating transfer contacts between the articles subjected to chaotic free movements and by spreading and/or spraying of coating material droplets deriving from the considerable acceleration to which said articles are subjected by the vibration of the tank.

[0007] The invention is illustrated by way of non-limiting example in the accompanying drawings in which:

Figure 1 shows schematically generic tank for containing the articles to be coated;
Figure 2 is a conceptual illustration of the principle of the process.

[0008] With reference to the aforesaid Figure 1, a vibrating tank 1 is lined internally with usual rubbery materials able to prevent damage to the surface of articles 2 which are subjected to collision against the inner surface of the tank by vibration. This tank rests on steel springs 3 supported by a fixed structure 4.

[0009] On the tank 1 there is fixed a usual vibrator device 5 which transfers to the tank 1 acceleration suitable for conferring, on the articles 2 contained therein, vibrations appropriate for performing one or more of the following functions:

a) completely stirring the totality of articles 2;
b) enabling the excess quantity of coating material, present on the surface of a region of any article, to separate from it.

[0010] To obtain said stirring, the articles could be subjected to vibration along a single axis; however, to achieve stirring suitable for any shape of article 2, the vibrations preferably have suitable components along all the three conventional axes x, y, z. The operating principles of the process will be more understood with reference to Figure 2. By placing on the base 8 of the tank 1 a certain minimum quantity of coating material 6, expressed by a level 9, it wets a certain minimum surface 7 of a generic article 2A, and adheres abundantly to it, to an extent depending on the viscosity of the coating material 6.

[0011] As a result of a vibrating action of the base wall 8 and the interference actions exerted by adjacent articles, the article 2A tends to change its spatial orientation, so that said region 7 becomes disposed in another position above the level 9 of the coating material 6.

[0012] As a result of this the coating material, adhering in abundant quantity to said immersed region 7, is brought into contact 14 with non-coated other regions of other adjacent articles, to hence be partially transferred to them.

[0013] In this manner, by a multiplicity of accidental contacts, the coating material which initially covered said surface 7 is gradually removed from this region of the article by the many innumerable random regions of other adjacent articles randomly brought into contact with said region 7 by the vibrating motion to which they are subjected by the tank 1.

[0014] As a result of this, only a minimum quantity of coating material remains adhering to said region 7, and can no longer be removed by further accidental contacts.

[0015] Extending this concept to all the articles, a mutual exchange of the excess coating material quantities on them is achieved in this manner. In other words, by defining a predetermined quantity of coating material sufficient for "complete minimum coating" of the articles, perfect uniformity of the layer of coating material deposited on them is achieved in this manner.

[0016] Moreover, considering that the vibrations induced on the articles result in their acceleration, it is evident that said acceleration creates forces of inertia which differ according to the mass on which they act. The result of this is that any drop 13 of coating material resting on a vibrating article 2B separates therefrom and is hence projected away from it in the form of minuscule droplets 15. As the article 2C is adjacent to it, these droplets 15 strike said adjacent article, which is therefore coated by them.

[0017] Moreover as this impact between droplets and adjacent articles is fairly violent, said droplets undergo flattening by dynamic squashing, this crushing contributing to perfect distribution of the coating material.

[0018] From the point of view of implementation, the process can be implemented by specific tanks, or by usual "vibration machines". The term "vibration machines" means machines similar to the usual "vibrating screens". Alternatively they can be those machines known in the sector as "tumbling machines" comprising a toroidal tank (upperly open), into which the articles are randomly fed, to be subjected to deburring and/or smoothing action by mixing them with abrasive articles of specific shape (generally conical).

[0019] In these usual tumbling machines there are generally three-dimensional vibrations present, which confer on the totality of articles to be processed and on the abrasive pieces a spiral orbital movement providing wide continuous stirring movement within the toroidal (or ring-shaped) form of the vibrating tank. As the process of the invention is suitable for articles which can be of totally different mass and shape, it is not possible to accurately establish the parameters of the acceleration to which the articles must be subjected to achieve the described effects, also because this acceleration depends on the amplitude of the vibrations, which depend on the power of the vibrating machine.

[0020] However, these vibrations are to be considered as lying within the range of said vibrating machines used in other sectors of the art for completely different purposes: i.e. with forcing frequencies generally between 15 and 25 Hz. The provision of a usual cock 10 on the base 8 of the tank advantageously enables any excess coating material to be extracted.

[0021] Advantageously the aforesaid process enables small coated articles to be produced automatically, rapidly and economically, especially wooden articles and especially using water-based coating materials.

[0022] Another advantage of the invention is the use of upperly open tanks on which usual blowers 12 can act to accelerate the drying time of the coating material. Advantageously, this process enables water-based coating materials to be used, including an aqueous styrene/acrylic polymer dispersion; or a mixture of natural and esterified mountain waxes containing an ethoxylated alcohol as non-ionic emulsifier, a styrene-acrylic polymer and a silicone anti-foaming agent.

Claims

1. A coating process, particularly for small-dimension wooden articles and water-based coating materials, **characterised by** placing the articles (2) in a vibrating tank (1) and pouring onto them a coating material (6) in the liquid state, in the quantity necessary for coating the articles, said coating taking place by application deriving from an infinity of small mutual coating transfer contacts between the articles (2) subjected to chaotic free movements and by spreading and/or spraying of coating material droplets (15) deriving from the considerable separation acceleration to which said articles are subjected by the vibrations of the tank.

2. A process as claimed in the preceding claim, **characterised by** the use of an upperly open vibrating tank of usual toroidal type, conferring on the articles a spiral motion movement along said toroidal track resulting in wide continuous stirring.

3. A process as claimed in the preceding claims, **characterised by** the supplementary intervention of air blown onto the vibrating articles to facilitate drying of the coating materials.

4. A process as claimed in the preceding claims, using a vibrating tank (1) provided with a bottom cock (10).

5. Coated articles obtained by the process of the preceding claims.

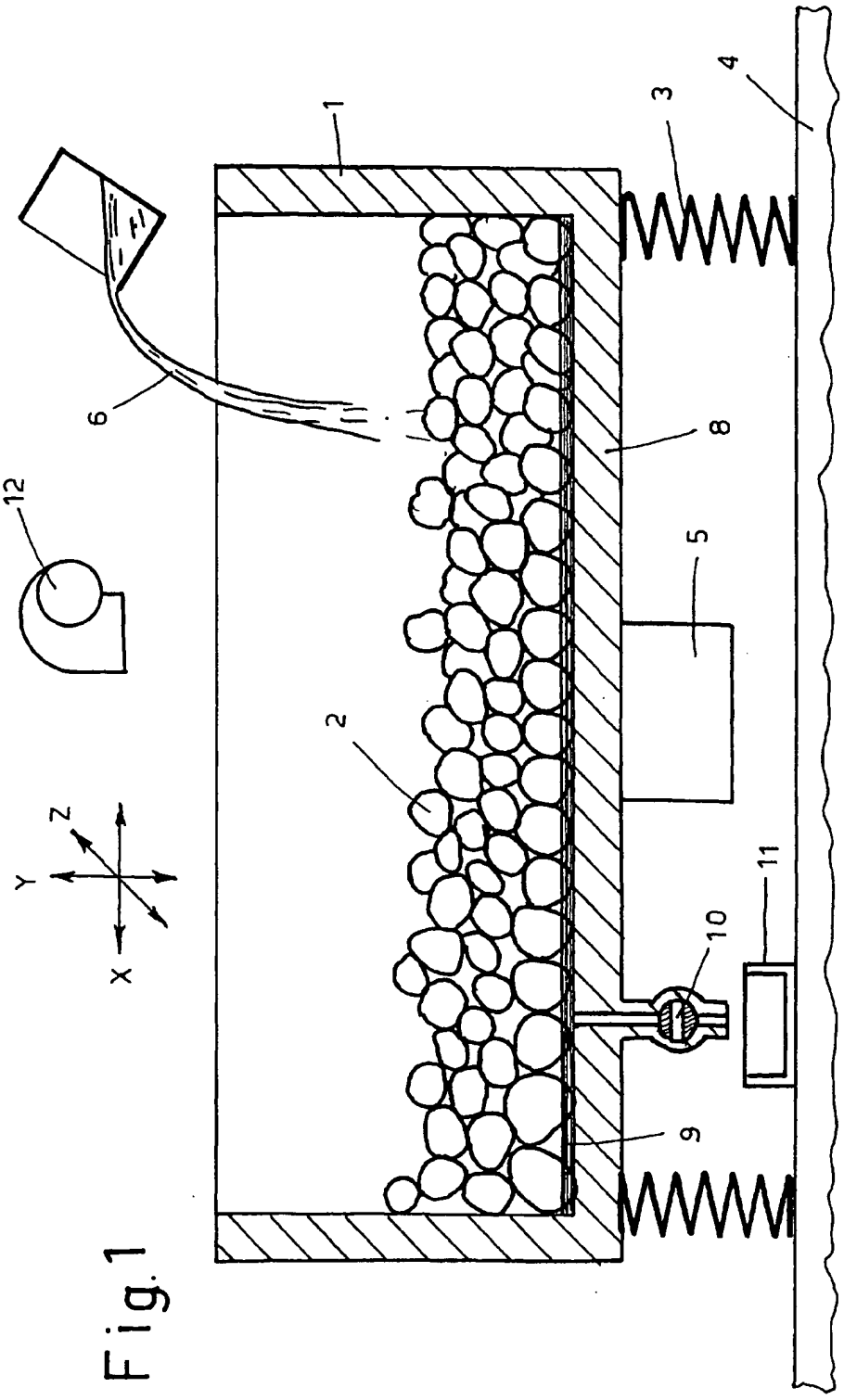
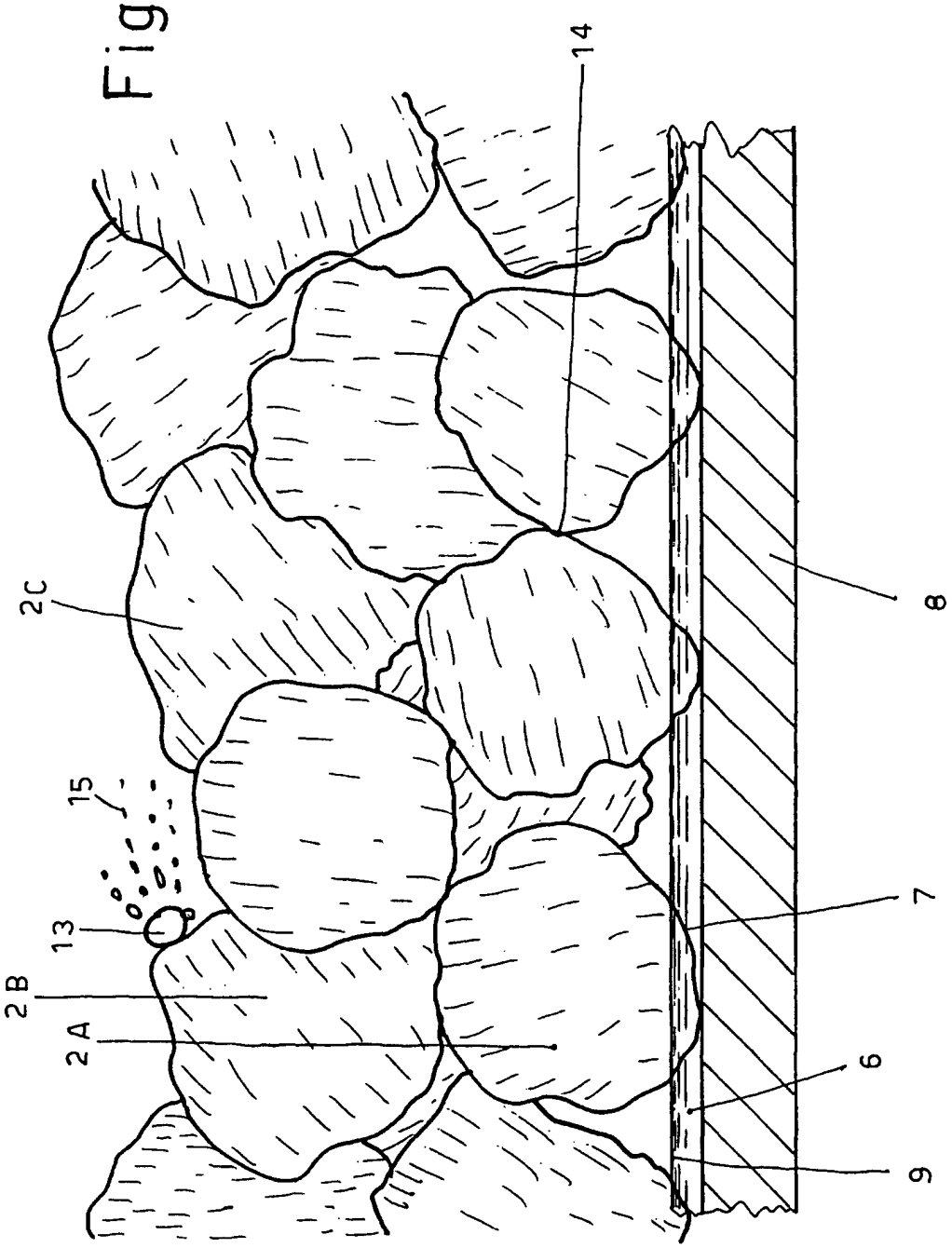


Fig. 1

Fig.2



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 12 6614

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	AT 393 646 B (DEILMANN AG C) 25 November 1991 (1991-11-25) * the whole document * ---	1-5	B05D7/06 B05D1/40 B05C3/05
A	EP 0 882 424 A (MANZONI & MANZONI) 9 December 1998 (1998-12-09) * the whole document * ---	1-5	
A	DE 12 26 906 B (C K WALTHER WALTER-TECHNIK) 10 December 1962 (1962-12-10) * the whole document * ---	1-5	
A	US 5 158 804 A (ALKAN M HAYAT ET AL) 27 October 1992 (1992-10-27) * the whole document * ---	1-5	
A	DATABASE WPI Section Ch, Week 198703 Derwent Publications Ltd., London, GB; Class D14, AN 1987-017573 XP002901605 & JP 61 274654 A (NIPPON SUISAN KAISHA LTD), 4 December 1986 (1986-12-04) * abstract; figure 1 * ---	1-5	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B05D B05C B24B
A	SOVIET INVENTIONS ILLUSTRATED Section PQ, Week 198104, 4 March 1981 (1981-03-04) Derwent Publications Ltd., London, GB; Class P42, XP002901606 * abstract * & SU 735 321 A (YAROSH ANATOLIJ) 25 May 1980 (1980-05-25) -----	1-5	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	19 January 2001	Slaby

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 12 6614

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-01-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
AT 393646 B	25-11-1991	DE 3221552 A	08-12-1983
		AT 199583 A	15-05-1991
EP 0882424 A	09-12-1998	IT BS970064 U	30-11-1998
		US 6110020 A	29-08-2000
DE 1226906 B	13-10-1966	GB 1017926 A	26-01-1966
US 5158804 A	27-10-1992	US 4919973 A	24-04-1990
JP 61274654 A	04-12-1986	JP 1706797 C	27-10-1992
		JP 3071875 B	14-11-1991

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82